

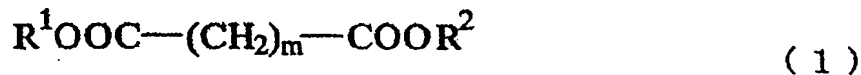
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DT04 Rec'd PCT/PTO 30 SEP 2004

Translation of PCT Article 34 Amendment

CLAIMS

1. An ester compound represented by formula (1)

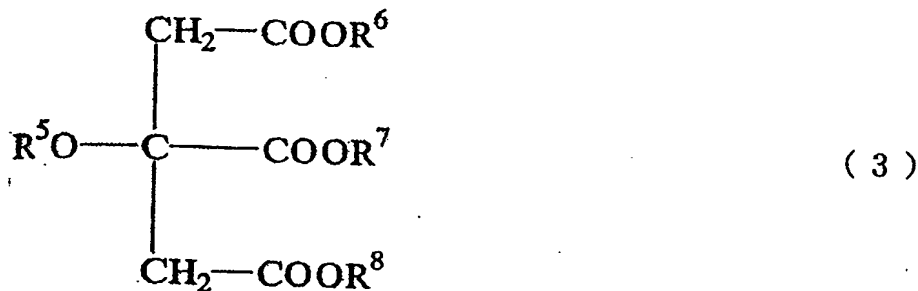


wherein R^1 and R^2 are different from each other and each
5 represents a group of formula (2)



wherein R^3 is a C_{1-6} alkylene group; R^4 is a C_{1-10} straight-
or branched-chain alkyl group, a C_{6-12} aryl group, C_{7-15}
arylalkyl group or a C_{7-15} alkylaryl group; m is an integer
10 from 0 to 8, and n is an integer from 0 to 6.

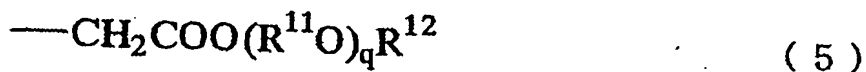
2. An ester compound represented by formula (3)



wherein R^5 is H, a C_{1-5} aliphatic acyl group or a C_{6-12}
aromatic acyl group; R^6 , R^7 and R^8 each represent a group
15 of formula (4) or (5)



wherein R^9 is a C_{1-6} alkylene group; R^{10} is a C_{1-10} straight- or branched-chain alkyl group, a C_{6-12} aryl group, a C_{7-15} arylalkyl group or a C_{7-15} alkylaryl group; and p is an integer from 0 to 6; and



5

wherein R^{11} is a C_{1-6} alkylene group; R^{12} is a C_{1-10} straight- or branched-chain alkyl group, a C_{6-12} aryl group, a C_{7-15} arylalkyl group or a C_{7-15} alkylaryl group; and q is an integer from 0 to 6;

10 with the proviso that the compound wherein R^6 , R^7 and R^8 are the same is excluded.

3. A plasticizer for biodegradable aliphatic polyester resins, the plasticizer comprising an ester of an aliphatic polybasic acid with at least two members
15 selected from the group consisting of alcohols and ether alcohols.

4. A plasticizer for biodegradable aliphatic polyester resins according to claim 3, wherein the ester is a compound represented by formula (1)



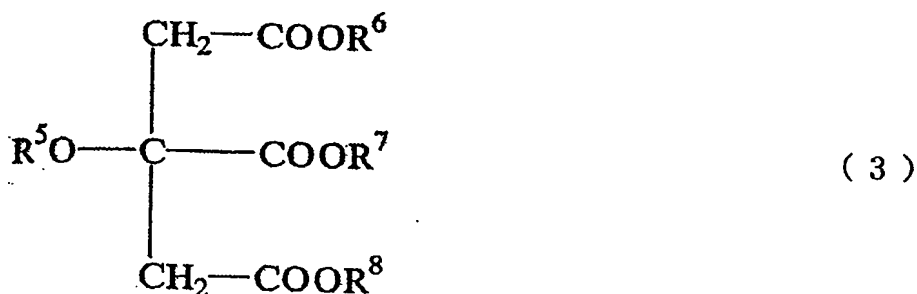
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wherein R^1 and R^2 are different from each other and each represents a group of formula (2)



wherein R^3 is a C_{1-6} alkylene group; R^4 is a C_{1-10} straight- or branched-chain alkyl group, a C_{6-12} aryl group, a C_{7-15} arylalkyl group or a C_{7-15} alkylaryl group; m is an integer from 0 to 8, and n is an integer from 0 to 6.

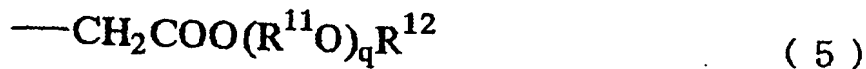
5. A plasticizer for biodegradable aliphatic polyester resins according to claim 3, wherein the ester is a compound represented by formula (3)



10 wherein R^5 is H, a C_{1-5} aliphatic acyl group or a C_{6-12} aromatic acyl group, and R^6 , R^7 and R^8 each represent a group of formula (4) or (5)



15 wherein R^9 is a C_{1-6} alkylene group; R^{10} is a C_{1-10} straight- or branched-chain alkyl group, a C_{6-12} aryl group, a C_{7-15} arylalkyl group or a C_{7-15} alkylaryl group; and p is an integer from 0 to 6; and



wherein R^{11} is a C_{1-6} alkylene group; R^{12} is a C_{1-10} straight- or branched-chain alkyl group, a C_{6-12} aryl group, a C_{7-15} arylalkyl group or a C_{7-15} alkylaryl group; and q is
5 an integer from 0 to 6;

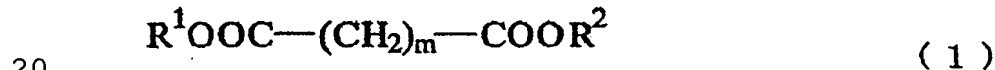
with the proviso that the compound wherein R^6 , R^7 and R^8 are the same is excluded.

6. Use of a compound according to claim 1 as a plasticizer for biodegradable aliphatic polyester resins.

10 7. Use of a compound according to claim 2 as a plasticizer for biodegradable aliphatic polyester resins.

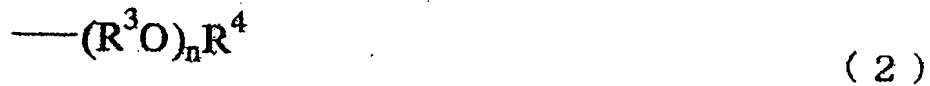
8. A biodegradable resin composition comprising (i) a biodegradable aliphatic polyester resin and (ii) a plasticizer comprising an ester of an aliphatic polybasic
15 acid with at least two members selected from the group consisting of alcohols and ether alcohols.

9. A biodegradable resin composition according to claim 8, wherein the plasticizer is a compound represented by formula (1)



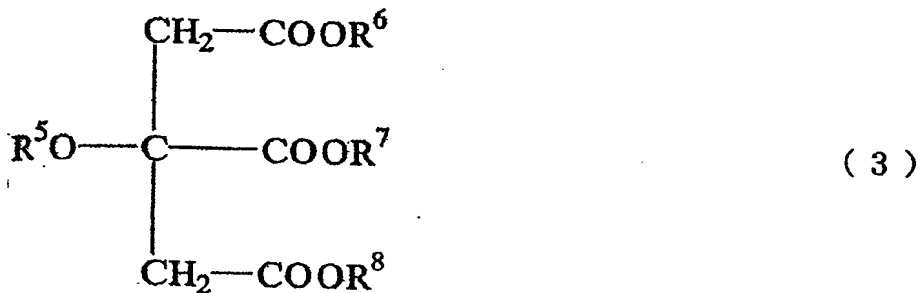
wherein R^1 and R^2 are different from each other and each represents a group of formula (2)

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wherein R^3 is a C_{1-6} alkylene group; R^4 is a C_{1-10} straight- or branched-chain alkyl group, a C_{6-12} aryl group, a C_{7-15} arylalkyl group or a C_{7-15} alkylaryl group; m is an integer from 0 to 8; and n is an integer from 0 to 6.

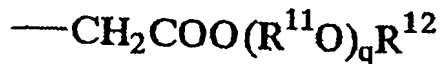
10. A biodegradable resin composition according to claim 8, wherein the plasticizer is a compound represented by formula (3)



10 wherein R^5 is H, a C_{1-5} aliphatic acyl group or a C_{6-12} aromatic acyl group, and R^6 , R^7 and R^8 each represent a group of formula (4) or (5)



15 wherein R^9 is a C_{1-6} alkylene group; R^{10} is a C_{1-10} straight- or branched-chain alkyl group, a C_{6-12} aryl group, a C_{7-15} arylalkyl group or a C_{7-15} alkylaryl group; and p is an integer from 0 to 6; and



(5)

wherein R^{11} is a C_{1-6} alkylene group; R^{12} is a C_{1-10} straight- or branched-chain alkyl group, a C_{6-12} aryl group, a C_{7-15} arylalkyl group or a C_{7-15} alkylaryl group; and q is
5 an integer from 0 to 6;

with the proviso that the compound wherein R^6 , R^7 and R^8 are the same is excluded.

11. A biodegradable resin composition according to any one of claims 8, 9 and 10, wherein the
10 biodegradable aliphatic polyester resin is at least one member selected from the group consisting of resins obtainable by condensation of hydroxycarboxylic acid(s) and resins obtainable by condensation of aliphatic dicarboxylic acid(s) and aliphatic diol(s).

12. A resin composition according to claim 11, wherein the biodegradable aliphatic polyester resin is a poly(lactic acid).

13. A resin composition according to claim 11, wherein the biodegradable aliphatic polyester resin is
20 polybutylene succinate, polybutylene succinate adipate or a mixture thereof.

14. A method for plasticizing a biodegradable aliphatic polyester resin, the method comprising adding to

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a biodegradable aliphatic polyester resin an ester compound represented by formula (1)



wherein R^1 and R^2 are different from each other and each
5 represents a group of formula (2)

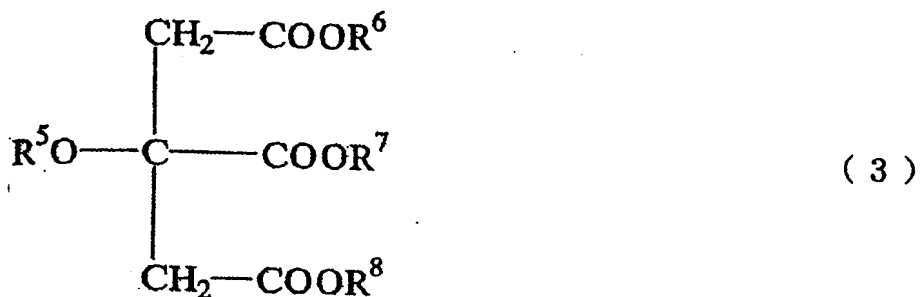


wherein R^3 is a C_{1-6} alkylene group; R^4 is a C_{1-10} straight-
or branched-chain alkyl group, a C_{6-12} aryl group, C_{7-15}
arylalkyl group or a C_{7-15} alkylaryl group; m is an integer
10 from 0 to 8, and n is an integer from 0 to 6.

15. A method according to claim 14, wherein the biodegradable aliphatic polyester resin is a poly(lactic acid).

16. A method according to claim 14, wherein the
15 biodegradable aliphatic polyester resin is polybutylene succinate, polybutylene succinate adipate or a mixture thereof.

17. A method for plasticizing a biodegradable aliphatic polyester resin, the method comprising adding to
20 a biodegradable aliphatic polyester resin an ester compound represented by formula (3)

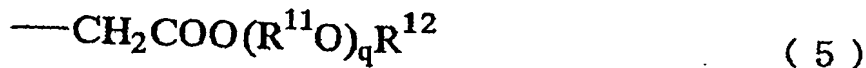


wherein R⁵ is H, a C₁₋₅ aliphatic acyl group or a C₆₋₁₂ aromatic acyl group; and R⁶, R⁷ and R⁸ each represent a group of formula (4) or (5)



5

wherein R⁹ is a C₁₋₆ alkylene group; R¹⁰ is a C₁₋₁₀ straight- or branched-chain alkyl group, a C₆₋₁₂ aryl group, a C₇₋₁₅ arylalkyl group or a C₇₋₁₅ alkylaryl group; and p is an integer from 0 to 6; and



10

wherein R¹¹ is a C₁₋₆ alkylene group; R¹² is a C₁₋₁₀ straight- or branched-chain alkyl group, a C₆₋₁₂ aryl group, a C₇₋₁₅ arylalkyl group or a C₇₋₁₅ alkylaryl group; and q is an integer from 0 to 6;

15

with the proviso that the compound wherein R⁶, R⁷ and R⁸ are the same is excluded.

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18. A method according to claim 17, wherein the biodegradable aliphatic polyester resin is a poly(lactic acid).

19. A method according to claim 17, wherein the
5 biodegradable aliphatic polyester resin is polybutylene succinate, polybutylene succinate adipate or a mixture thereof.